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## Jupiter Icy Moons Orbiter (JIMO)

# Mission Assurance Requirements

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## Change Log

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## **1.0 Introduction**

### **1.1 Purpose**

This document defines the Mission Assurance Requirements and approach to be utilized to satisfy the project objectives for the Jupiter Icy Moons Orbiter Project as stated in the Preliminary Project Plan for the Project Prometheus Jupiter Icy Moons Orbiter Project (982-0001).

### **1.2 Scope**

The Mission Assurance requirements specified herein shall apply to each organization, both internal and external to JPL, supplying hardware or software used for the JIMO Space System, which includes the Reactor Module and the Spacecraft Module. Mission Assurance requirements for the Mission Module and associated instruments are specified in Section 4. A summary of applicability of Mission Assurance Documents is provided in Table 1.

### **1.3 Definitions**

The following definitions are used throughout this document:

“**Shall**” defines a requirement that requires a waiver if not performed.

“**Will**” defines a function that is expected to be performed during the implementation of the JIMO Mission Assurance Program, however, does not require a waiver when not performed.

“**Should**” defines a “best practice” and is strongly recommended but does not require a waiver when not performed.

### **1.4 Responsibilities**

The JPLSpace System Mission Assurance Manager (MAM) is assigned as a member of the JIMO Project staff and functionally reports to the Project Manager. The JIMO Space System MAM is responsible for managing and coordinating the support and participation of the various areas of mission assurance expertise across the project. The JIMO Space System MAM will establish and implement an overall Mission Assurance Program, which encompasses Product Assurance, Risk Assessment and Reporting, System Verification and Validation, and Safety Practices. The JIMO Space System MAM will participate in the evaluation and assessment of technical and programmatic risk and will provide advice to the JIMO Project Manager. In addition, the JIMO Space System MAM will maintain an independent reporting function to the Office of Safety and Mission Success. The JIMO Space System MAM will be responsible for reporting the status of the JIMO Mission Assurance Program.

The Spacecraft Module Assurance Manager is assigned as a member of the Mission Assurance Team and functionally reports to the JIMO Space System Mission Assurance Manager. The

Spacecraft Module Assurance Manager is responsible for managing and coordinating the mission assurance activities and implementation of the JIMO Mission Assurance Plan and associated requirements on the spacecraft module. The Spacecraft Module Assurance Manager will also oversee the mission assurance efforts at the spacecraft system contractor and interface with his/her counterpart.

The Mission Module Assurance Manager is assigned as a member of the Mission Assurance Team and functionally reports to the JIMO Space System Mission Assurance Manager. The Mission Module Assurance Manager is responsible for managing and coordinating the mission assurance activities and implementation of the JIMO Mission Assurance Plan and associated requirements on the Mission Module. The Mission Module Assurance Manager will also oversee the mission assurance efforts at all Mission Module support contractors and partners.

The Reactor Module Assurance Manager is assigned as a member of the Mission Assurance Team and functionally reports to the JIMO Space System Mission Assurance Manager. The Reactor Module Assurance Manager is responsible for managing and coordinating the mission assurance activities and implementation of the JIMO Mission Assurance Plan and associated requirements on the Reactor Module. The Reactor Module Assurance manager will also oversee the mission assurance efforts at all Reactor Module support contractors and partners

The Contractor Mission Assurance Manager is assigned as a member of the Mission Assurance Team. The Contractor Mission Assurance Manager is responsible for managing and coordinating the mission assurance activities and implementation of the Contractor's Mission Assurance Implementation Plan and associated requirements. The Contractor Mission Assurance Manager will interface with the JPL Spacecraft Module Assurance Manager.

The Mission Assurance Program will be implemented using a concurrent engineering approach in all related disciplines. The Mission Assurance Management Team and other key personnel will be an integral part of the Project Design Team and will have the responsibility of coordinating and managing all Mission Assurance activities including:

- Reliability Assurance
- Electronic Parts
- Radiation Assessment, Test and Mitigation
- Hardware Quality Assurance
- Software Quality Assurance
- Problem Failure Reporting
- Materials and Processes Control
- Contamination Control
- Environmental Test and Analysis
- System Safety Engineering
- System Verification and Validation
- Risk Assessment and Reporting

## **2.0      Applicable Documents**

The following documents, of the issue in effect on the date of invitation for bids, or request for proposal, form a part of this document to the extent specified herein or in the supporting JPL requirements documents.

JPL 982-00001	Preliminary Project Plan for the Project Prometheus Jupiter Icy Moons Orbiter Project
JPL 982-00029	JIMO Environmental Requirements Document
JPL 982-00028	JIMO Radiation Control and Verification Requirements
JPL 982-00025	JIMO Parts Program Requirements
JPL 982-00037	JIMO Reliability Assurance Requirements
DMIE-53052	JPL Waiver Procedure
JPL 982-00013	JIMO Project Review Plan
JPL D-560	JPL Standard for System Safety
JPL 982-00032	JIMO Project System Safety Program Plan
JPL 982-00027	JIMO Configuration Management Plan
JPL 982-00039	JIMO Materials and Process Control Requirements
JPL 982-00038	JIMO Software Quality Assurance Requirements
JPL 982-00042	JIMO Hardware Quality Assurance Requirements
JPL 982-00030	JIMO System-Level Contamination Control Requirements
JPL 982-00036	JIMO Problem Failure Reporting Requirements

## **3.0      Applicability of Requirements**

All JIMO partners, contractors and their subcontractors shall comply with all the requirements contained in this document. A JIMO Mission Assurance Implementation Plan, satisfying the requirements specified or referenced in 2.0 and covering the activities at the organization, shall be developed and submitted for JPL review and approval.

An individual shall be designated, within the organization, to be responsible for planning and management of Mission Assurance activities including:

- Overall Product Assurance
- Hardware Quality Assurance

- Software Quality Assurance
- Radiation Assessment, Test and Mitigation
- Reliability Analysis and Assurance
- Problem Reporting System
- Parts Program
- Materials and Processes Control
- Contamination Control
- Configuration Management
- Environmental Test and Analysis Program
- System Safety Engineering
- Risk Assessment and Reporting

### **3.1      Implementation**

A Mission Assurance Manager shall be assigned by the Contractor to be responsible for planning, managing and coordinating the Contractor mission assurance activities. . The Contractor Mission Assurance Manager will have the responsibility of coordinating the support and participation of the various areas of Contractor mission assurance expertise. The Contractor Mission Assurance Program , and its functional supporting elements, will have high visibility and direct reporting to the Contractor Project Management and will also have a direct reporting function to the Contractor Mission Assurance Organization. The Contractor Mission Assurance Manager, in coordination with the JPL Spacecraft Module Assurance Manager, will be responsible for reporting the status of the JIMO Spacecraft Module Mission Assurance Program.

The Mission Assurance Program will be implemented using a concurrent engineering approach in all related disciplines. The Contractor Mission Assurance Manager and other key personnel will be an integral part of the Project Design Team. The Contractor Mission Assurance Manager will have the responsibility of coordinating and managing all Mission Assurance activities including:

- Reliability Analysis, Test and Verification Assurance
- Electronic Parts Selection, Test and Characterization
- Radiation Assessment, Test and Mitigation
- Hardware and Software Quality Assurance
- Problem Failure Reporting
- Materials and Processes Control
- Contamination Control
- Environmental Test and Analysis
- System Verification and Validation
- Risk Assessment and Reporting

### **3.2        Reviews**

The Project will implement a formal review program as specified in the JIMO Project Review Plan (982-00013). The Mission Assurance team will support any project reviews as necessary.

### **3.3        Environmental Requirements**

The environmental requirements for JIMO are contained in the JIMO Environmental Requirements Document (ERD) (JPL 982-00029). An implementation plan, satisfying the requirements, shall be developed and submitted for JPL review and approval.

#### **3.3.1      Radiation Control and Verification Requirements**

The Radiation Control and Verification Requirements specified in JPL 982-00028 shall be implemented to verify that the JIMO hardware has been evaluated for survivability in the JIMO radiation environment as specified in the Environmental Requirements Document (JPL 982-00029). The Radiation Control Engineer (RCE) will work concurrently with the Cognizant Engineers, Reliability Engineers and Parts Program Engineers in order to facilitate the completion of the Radiation Analysis Completion Statements (RACS) and the verification that all JIMO hardware meets the mission radiation requirements.

#### **3.3.2      Electromagnetic Interference and Compatibility Control Plan**

The Electromagnetic Interference and Compatibility (EMI/EMC) Control Plan shall satisfy the EMI/EMC requirements specified in the Environmental Requirements Document (JPL 982-00029). The Environments Control Engineer will work concurrently with the Cognizant Engineers, Reliability Engineers and Parts Program Engineers in order to facilitate the completion of the Environmental Test and Authorization Summary Statements (ETAS) and the verification that all JIMO hardware meets the mission environmental requirements. The contractor Electromagnetic Interference and Compatibility Control Plan shall be submitted for JPL review and approval.

#### **3.3.3      Magnetics Control Plan**

The Magnetics Control Plan shall satisfy the magnetics requirements specified in the Environmental Requirements Document (JPL 982-00029). The Magnetics Control Engineer will work concurrently with the Cognizant Engineers , Reliability Engineers and Parts Program Engineers in order to facilitate the completion of the Environmental Test and Authorization Summary Statements (ETAS) and the verification that all JIMO hardware meets the mission magnetic environments requirements. The contractor Magnetic Control Plan shall be submitted for JPL review and approval.

### **3.4        Electronic Parts**

The electronic parts requirements for JIMO are contained in the JIMO Parts Program Requirements (JPL 982-00025). An implementation plan, satisfying the requirements, shall be developed and submitted for JPL review and approval.

### **3.5 Reliability Assurance**

The reliability assurance requirements for JIMO are contained in the JIMO Reliability Assurance Requirements (JPL 982-00037). An implementation plan, satisfying the requirements, shall be developed and submitted for JPL review and approval.

### **3.6 Hardware Quality Assurance**

The hardware quality assurance requirements for JIMO are contained in the JIMO Hardware Quality Assurance Requirements (JPL 982-00042). An implementation plan, satisfying the requirements, shall be developed and submitted for JPL review and approval

### **3.7 Software Quality Assurance**

The software quality assurance requirements for JIMO are contained in the JIMO Software Quality Assurance Requirements (JPL 982-00038). An implementation plan, satisfying the requirements, shall be developed and submitted for JPL review and approval

### **3.8 Systems Safety**

The System Safety engineering requirements for JIMO are contained in the JPL Standard for System Safety (JPL D-560). The system safety management approach is described in the JIMO Project System Safety Program Plan (JPL 982-00032). A System Safety Implementation Plan shall be developed and submitted for JPL review and approval. The System Safety Implementation Plan shall meet the system safety requirements specified in JPL D-560, the management approach described in JPL 982-00032, and address the design and verification of the flight hardware, design and verification of support equipment, and the safe design and conduct of all operations.

### **3.9 Risk Management**

The JIMO Project Risk Management Plan (JPL 982-00009) describes the implementation of risk management. The plan is consistent with NASA NPG 7120.5A. The JIMO Project Manager will assign a Risk Coordinator who will be responsible for the coordination of the Risk Lists, risk status reporting, risk analyses and will participate in risk management decisions. The Mission Assurance Manager will participate in the evaluation and assessment of technical and programmatic risks and will advise the project manager.

### **3.10 Configuration Management**

The JIMO Configuration Management Plan (JPL 982-00027) describes the implementation of configuration management. The Project shall implement a Configuration Management (CM) program at all levels of the JIMO Mission System Development. The Configuration Management Engineer (CME) will be responsible for managing the configuration of all of the JIMO mission system hardware, software and documentation.

### **3.11 Lessons Learned**

The JIMO Project shall implement the NASA Lessons Learned into the design, development, test and integration of the Project's hardware and software deliverables. An implementation plan, satisfying the requirements, shall be developed and submitted for JPL review and approval.

### **3.12 Materials and Processes Control**

The material and processes control requirements for JIMO are contained in the JIMO Materials and Processes Control Requirements (JPL 982-00039). An implementation plan, satisfying the requirements, shall be developed and submitted for JPL review and approval.

### **3.13 Contamination Control**

The contamination control requirements for JIMO are contained in the JIMO System-Level Contamination Control Requirements (JPL 982-00032). An implementation plan, satisfying the requirements, shall be developed and submitted for JPL review and approval.

### **3.14 Waivers**

All "Shall" requirements contained in this and supporting documents shall be met by the JIMO project and it's partners, contractors and their subcontractors. Deviations from JPL approved plans shall be documented per the JPL Waiver Procedure (DMIE-53052) and submitted for JPL review and approval.

## **4.0 Mission Module Mission Assurance Requirements – TBD**

## **5.0 Launch Vehicle Interface**

Applicable Mission Assurance Requirements for the JIMO Launch Vehicle interface are specified in the "JIMO Launch Vehicle Interface Requirements Document" ([JPL 982-xxxxx](#))

Table 5-1 Applicability of Mission Assurance Documents

<b>Reference Document</b>	<b>Title</b>	<b>Spacecraft Module</b>	<b>Reactor Module</b>	<b>Mission Module</b>	<b>Launch Vehicle</b>
982-00035	Mission Assurance Requirements	Required	Required	Required	
982-00029	Environmental Requirements Document	Required	Required	Required	TBD

<b>Reference Document</b>	<b>Title</b>	<b>Spacecraft Module</b>	<b>Reactor Module</b>	<b>Mission Module</b>	<b>Launch Vehicle</b>
982-00028	Radiation Control and Verification Requirements	Required	Required	Required	TBD
982-00025	Parts Program Requirements	Required	Required	Required	TBD
982-00037	Reliability Assurance Requirements	Required	Required	Required	TBD
982-00013	Project Review Plan	Required	Required	Required	TBD
982-00032	Project System Safety Program Plan	Required	Required	Required	TBD
982-00027	Configuration Management Plan	Required	Required	Required	TBD
982-00039	Materials and Processes Requirements	Required	Required	Required	TBD
982-00036	Problem Failure Reporting Requirements	Required	Required	Required	TBD
982-xxxx	Hardware Quality Assurance Requirements	Required	Required	Required	TBD
982-00030	System-Level Contamination Control Requirements	Required	Required	Required	TBD